Heart Failure in Sub-Saharan Africa: Time for Action

Albertino Damasceno, MD, PhD, Gad Cotter, MD,† Anastase Dzudie, MD,‡ Karen Sliwa, MD, PhD,§ Bongani M. Mayosi, MBChB, DPhil‖*

**Faculdade de Medicina, Universidade Eduardo Mondlane, Maputo, Mozambique;*
†Duke University Medical Center, Durham, North Carolina;
‡Cardiology Unit, Department of Internal Medicine, Cardiology Unit, Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, Yaoundé, Cameroon;
§Soweto Cardiovascular Research Unit, Department of Cardiology, Chris Hani Baragwanath Hospital, University of the Witwatersrand, Johannesburg, South Africa; and
‖Department of Medicine, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa

In common with many elderly women in these parts, Grandmother suffered from high blood-pressure and a weak heart. The condition was so common I always assumed there was something of a fashion about it.

Morabo Morojele (1)

In the past few decades, heart failure has emerged as a major public health problem in developed countries, imposing an escalating burden on their health care systems. In some European countries and the U.S., as much as 1% of the health budget is spent on the management of heart failure. In the U.S., inpatient treatment of heart failure accounts for about U.S. $13 billion per year, and the amount spent on outpatient care is at least 4 times higher. Regretfully, most of the published data on heart failure is based on work in Caucasian populations within the developed world, and data on its incidence, prevalence, etiology, treatment, and outcome in Africa are lacking (2). As a result of improvements in the control of communicable diseases and malnutrition on the one hand and the migration to the cities with a complete change in the living habits on the other hand, cardiovascular diseases such as hypertension and stroke are increasingly recognized as significant causes of morbidity and mortality in most African countries (3). Nowadays, cardiovascular diseases account for 7% to 10% of all medical admissions to hospital, with heart failure contributing to 3% to 7% (4,5). In this paper we summarize the current state of knowledge on the etiology, treatment, and outcome of heart failure in Africa. Furthermore, we propose to establish a large prospective multicenter multinational register to define the causes, contemporary treatment, and outcome of patients with heart failure in sub-Saharan Africa. These data will assist in developing a strategy for the early detection, treatment, and prevention of heart failure on the continent.

History of Heart Failure Research in Sub-Saharan Africa

The problem of heart failure has been recognized in sub-Saharan Africa for over 60 years (6). There are at least 11 clinical studies (Table 1) and 4 necropsy series (Table 2) that have examined the etiology of heart failure of hospitalized Africans in this period (4,5,7–19). There are 3 major trends that are evident from this experience. First, the vast majority of heart failure cases in sub-Saharan Africa are due to the major nonischemic causes, with rheumatic heart disease, hypertensive heart disease, and cardiomyopathy accounting for over 75% of cases in most series. Second, ischemic heart disease remains an uncommon cause of heart failure with no apparent increase in its contribution to the cases of heart failure over the past 60 years. This observation supports the proposal that nonischemic heart disease is the priority for research and clinical intervention in Africa (20). Finally, the contribution of cor pulmonale and pericarditis to about 20% of cases of heart failure reflects the continuing impact of tuberculosis on heart disease on the continent. Cor pulmonale is mainly related to post-tuberculosis lung

damage, and pericarditis is overwhelmingly due to tuberculous involvement (21). It is heartening to note, however, that syphilis is no longer a major factor, a development that is probably related to the wide use of penicillin.

Contemporary Studies of Heart Failure in Sub-Saharan Africa

The majority of the clinical studies of heart failure in sub-Saharan Africa were conducted in the pre-echocardiographic era or without the application of echocardiography in the majority of cases (4,7–13). Oyoo and Ogola (5) conducted what was probably the first echocardiography-based study of the etiology of heart failure in 91 consecutive patients who were admitted to the Kenyatta National Hospital in Nairobi, Kenya. The case definition was based on the Framingham study, and the clinical assessment included echocardiography. The main etiology of heart failure was rheumatic heart disease (32%), followed by dilated cardiomyopathy (25%) and hypertensive heart disease (17%) (Table 1). The relative importance of these etiologies was similar for both genders. Ischemic heart disease accounted for only 2% of cases, a proportion that is similar to other parts of Africa (15).

In a study of 167 consecutive patients admitted to the Yaoundé General Hospital in Cameroon and evaluated by echocardiography, heart failure accounted for 5.8% of all hospital admissions, rehospitalization rate was 8.3%, and the overall in-hospital mortality was 9% (15). Forty-four percent of patients were in New York Heart Association functional class III, and 7% were in class IV. Cardiac cavities were dilated, and left ventricular ejection fraction was low in patients with systolic (70%) and combined systolic and diastolic (20%) dysfunction. Isolated diastolic heart failure accounted for 10% of cases. The main causes of heart failure were hypertension (54%), cardiomyopathy (26%), and valvular heart disease (24%) (Table 1). Medical treatment consisted of loop diuretics (90%), angiotensin-converting enzyme (ACE) inhibitor (65%), digoxin (31%), and beta-blockers (20%).

Africa is challenged by more than 30 million people infected with the human immunodeficiency virus (HIV). As a consequence, HIV cardiac-related pathology, which is mainly dilated cardiomyopathy and tuberculous pericarditis, is an important cause of heart failure in most African countries (22). The fact that HIV-associated cardiomyopathy has a poor prognosis, with progression to death

Table 1 Etiology of Heart Failure in Africa: Clinical Series

	Gelfand (7) 1957 Zimbabwe	Schwartz et al. (8) 1958 South Africa	Shaper and Williams (9) 1960 Uganda	Cosnett (10) 1962 South Africa	Baldachin (11) 1962 Zimbabwe	Powell and Wright (12) 1965 South Africa	Antony (4) 1980 Nigeria	Maharaj (13) 1991 South Africa	Oyoo and Ogola (5) 1999 Kenya	Thiam (14) 2003 Senegal	Kingue et al. (15) 2005 Cameroon
Total cases (n)	189	275	712	1,000	564	270	315	225	91	170	167
Rheumatic heart disease	27.0%	23.6%	14.7%	20.5%	38.3%	17.0%	13.7%	11.1%	31.9%	34.1%	24.6%
Hypertensive heart disease	14.8%	19.6%	37.4%	20.2%	22.2%	14.0%	11.7%	13.8%	17.6%	44.7%	54.5%
Dilated cardiomyopathy*	15.4%	37.5%	—	13.8%	7.3%	34.0%	47%	48.4%	25.3%	—	26.3%
Endomyocardial fibrosis	—	—	13.6%	—	—	—	—	—	—	—	—
Cor pulmonale	3.7%	10.9%	0.28%	16.2%	5.1%	10.0%	6.3%	16.9%	7.7%	—	—
Pericarditis	6.9%	4.0%	3.5%	2.5%	2.8%	6.0%	—	8.0%	13.2%	—	—
Syphilitic heart disease	10.5%	1.1%	13.6%	8.8%	11.3%	10.0%	—	—	—	—	—
Ischemic heart disease	—	0.4%	1.3%	0.6%	—	—	—	—	2.2%	—	—
Congenital heart disease	8.9%	1.1%	1.3%	0.6%	7.1%	—	—	—	2.2%	—	2.4%
Miscellaneous†	12.8%	—	14.6%	17%	5.9%	9.0%	21.2%	1.8%	—	6%	—

*Includes peripartum cardiomyopathy; †includes anemia, 'senile' (or multiple causes), and undetermined cause. — = no information provided.

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Table 2 Etiology of Heart Failure in Africa: Necropsy Series

	Becker (16) 1946 South Africa	Davies (17) 1948 Uganda	Higginson et al. (18) 1960 South Africa	Kallichurum (19) 1969 South Africa
Total cases (n)	332	229	537	694
Rheumatic heart disease	23.5%	3.4%	32.4%	21.5%
Hypertensive heart disease	28.6%	31%	18.6%	18.9%
Dilated cardiomyopathy*	—	—	14.9%	15.8%
Endomyocardial fibrosis	—	9.6%	—	—
Cor pulmonale	10.0%	3.9%	15.6%	12.0%
Pericarditis	—	3.5%	4.8%	7.6%
Syphilitic heart disease	16.9	20.9%	6.1%	4.8%
Ischemic heart disease	1.5	4.3%	2.2%	2.2%
Congenital	1.8%	—	—	7.0%
Miscellaneous†	10.3%	—	3.0%	10.2%

*Includes peripartum cardiomyopathy; †includes anemia, 'senile' (or multiple causes), and undetermined cause. — = means no information provided.

within 100 days of diagnosis in patients who are not treated with antiretroviral drugs, and as the vast majority of HIV patients in this continent are not able to receive any kind of antiretroviral therapy, this brings another heavy burden of patients with heart failure with a very poor prognosis.

Several papers have been published recently showing that a rapid epidemiologic transition is on the way in sub-Saharan Africa. The urbanization process has enormously increased the prevalence of cardiovascular risk factors, mainly hypertension, diabetes, and obesity, paving the way for the substrate to a new epidemic in the future, the ischemic heart disease (23–25).

Economic Implications of Heart Failure in Sub-Saharan Africa

As previously alluded to, heart failure accounts for approximately 1% of the health budget in the developed countries. Such data is not available for Africa, although some estimates can be generated indirectly. For instance, approximately 3% to 7% of patients admitted to hospitals in Africa have heart failure (4,5). This figure is similar to the rate described in the developed countries. No information is available for the prevalence of heart failure in the general population. It is conceivable, however, that heart failure has at least a similar relative economic impact on health resources in Africa as in the developed countries, so that 1% of the health budget is spent on the management of patients with heart failure.

The common causes of heart failure in sub-Saharan Africa, such as rheumatic heart disease, peripartum cardiomyopathies (26), endomyocardial fibrosis (27), and HIV-related cardiomyopathy, appear in much younger groups than elsewhere, which puts an extra economic burden as a consequence of the amount of active life years lost for productive tasks in these patients. Importantly, learning from the experience of the progression of the heart failure epidemic in the more developed countries, it is conceivable that the incidence of heart failure in Africa will increase over the next 50 years. If not addressed, the increased proportion of elderly and the escalating number of patients with obesity, hypertension, diabetes mellitus, metabolic syndromes, and coronary artery disease will lead to rapidly increasing numbers of patients with heart failure. For instance, coronary artery disease and diastolic heart failure (due to hypertension and aging), the leading causes of heart failure in developed countries, are the cause for only a minority of heart failure and cardiovascular disease in general in Africa (20). If these 2 conditions will assume the same role in the pathophysiology of heart failure in Africa as in the rest of the world, the incidence and prevalence of heart failure in Africa may be expected to rise dramatically in the future.

The Opportunity

Heart failure is both a preventable and treatable disease. Therefore, early diagnosis and treatment of heart failure can lead to dramatic decreases in the morbidity and mortality

from the disease. To illustrate such a possible effect, we will describe the effect of several priority interventions:

1. Diagnosing and treating hypertension: During the last few decades it was suggested that treatment of hypertension may have a significant effect on the reduction of heart failure. This issue was shown to be more important in African Americans who tend to develop more systolic dysfunction due to hypertension (28). Hence, it is conceivable that enhanced diagnosis and treatment of hypertension may lead to a significant reduction in the rate of heart failure in Africa.
2. Diagnosing and treating rheumatic heart disease: Rheumatic heart disease is preventable (29,30). Many previous studies have confirmed that administration of antibiotic therapy to children ages 3 to 15 years will prevent the devastating consequence of rheumatic fever, both from the health and economic perspective. Hence, defining the extent of the problem will help design and implement a prevention program for rheumatic heart disease in children (31,32) and facilitate the planning of timely cardiothoracic surgery for established advanced valve disease.
3. Diagnosing and treating systolic heart failure: The diagnosis of heart failure has many implications, especially since systolic heart failure (the form most common in Africa, see the preceding text) is amenable to treatment. In the last few years, much progress was achieved in the treatment of heart failure. Many new medications were shown to be effective in both improving symptoms and outcome. Although most studies performed in heart failure patients pertain mostly to Caucasian patients and patients in developed regions, there is no reason to believe that the findings are not applicable to Africans and other human beings in general. Some studies have suggested, however, that African-American patients may have a less active renin-angiotensin system and a lower bioavailability of nitric oxide than Caucasians, which would justify a better response to a combination of isosorbide dinitrate/hydralazine than ACE inhibitors (33). For instance, the A-HeFT (African American Heart Failure Trial) study has examined the effect of administering hydralazine and nitrates combination to African Americans with systolic heart failure (33). This study has demonstrated a significant improvement in all major outcomes including mortality, readmission to hospital, and quality of life. A pharmaco-economic analysis has shown that the effect of this treatment will also lead to a significant decrease in health cost by about 25% to 40% (34). Since this treatment has been generic for >20 years now, its cost is low (U.S. $0.2/day), it is possible that its administration in Africa will lead to similar resource savings as in the West. However, to be effective, this treatment should be administered to patients with heart failure due to systolic dysfunction, again, requiring capabilities to diagnose the disease. The hypothesis that an isosorbide dinitrate/hydralazine combination is also more effective than an ACE inhibitor should also be tested in the near future in an African population with systolic heart failure. Nevertheless, we are convinced that, due to the lack of recent information on the etiology of heart failure, a prospective multicenter registry is the priority.

The Proposed Plan of Action: A Prospective Multicenter Registry

We propose a prospective multicenter registry that will be implemented in 3 stages to the study of the epidemiology and management of heart failure in Africa.

The first stage—preliminary definition of the problem. There is a lack of data on the incidence, prevalence, etiology, treatment, and outcome of the disease in general and its geographical variation by region and country in Africa. To better define this, we propose a simple registry of patients admitted to hospital with heart failure in Cameroon, Mozambique, Nigeria, South Africa, and other countries. The registry will include information on the patients' course before the admission, the in-hospital phase, and a short follow-up (6 to 12 months). It will also include 1 echocardiographic evaluation of the patients (during the admission).

The second stage—a larger registry and comprehensive plan. If the preliminary stage is successful, showing that indeed heart failure is common in the participating centers and could be diagnosed with the combination of clinical characteristics and echocardiographic evaluation, the second stage would include dissemination of this program to more centers, gradually transforming it from a scientific-oriented registry to a comprehensive diagnosis and treatment program. This program will focus on diagnosing heart failure, its existence, severity, and type and then treating it. As the program progresses, it will strive to establish long-standing follow-up of patients on an outpatient basis.

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As this registry develops, it could be turned into an educational tool through which resources will be progressively shifted toward peripheral community medical centers where better diagnosis and treatment of heart failure are expected to have a significant effect on health and health economics.

Future steps. After defining more clearly the etiology, pathophysiology, course, and treatment of heart failure in Africa, a 2-pronged approach is proposed:

First, a vast area of research is the therapeutic approach of heart failure in Africa. As very few clinical trials testing treatment of heart failure were previously done in Africa, one could question if what is accepted as a standard therapeutic approach is also effective in Sub-Saharan Africa. For example, the low renin levels already described in the African populations could justify that a beta-blocker, being more effective than an ACE inhibitor, should be used before the last one as was previously described by some of us (35). The same could be tested for the possible benefit of the isosorbide dinitrate/hydralazine compared with the use of an ACE inhibitor.

Another area of future research in a continent with very few human and material resources could be the use of innovative and low-cost approaches to control patients with cardiac failure. A wide camp of collaborative studies and partnerships with groups of researchers from other parts of the world is open behind us.

We will attempt to explore in more detail the treatment of heart failure, with particular relevance to diseases that are common in Africa, such as postpartum cardiomyopathy and endomyocardial fibrosis. Some heart failure syndromes, such as hypertensive heart disease, may have a different course and pathophysiology in Africa and, hence, may need different treatment (28).

Second, prevention. As alluded to in the preceding text, the prevention of heart failure in Africa may require a different approach from that adopted in developed regions because of differences in the etiology of heart disease in Africa, which are largely due to nonischemic causes (20). Therefore, although coronary artery disease is expected to increase dramatically in the future in the short term, prevention of ischemic heart disease may be expected to have a smaller role in the prevention of heart failure in Africa while having a dramatic effect in developed regions. By contrast, the treatment of hypertension and prevention of rheumatic fever will have a larger effect in Africa (20).

Conclusions

Heart failure is an important cause of morbidity and mortality in Africa. While it is apparent that the causes of heart failure are largely nonischemic in Africans, the incidence, prevalence, treatment, and outcome are not defined. By comparing the percent of hospital admissions in Africa and the developed world, it is likely that heart failure has a significant effect on the health and health economics in Africa. Efforts should be put forward to characterize this disease and ultimately improve its detection, treatment, and possibly prevention.

Please note: Dr. Cotter is currently affiliated with Momentum-Research Inc., Durham, North Carolina.

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